P-81

Microstructure and electrical properties of thin SiC films on Si substrates of *p*- and *n*-types

O.N. Sergeeva[1], A.V. Solnyshkin[1], G.M. Nekrasova[2], S.V. Senkevich[3], I.P. Pronin[3], S.A. Kukushkin[4]

[1]*Tver State University,170100, Tver, Russia*
e-mail: o_n_sergeeva@mail.ru

[2]*Tver State Agricultural Academy,170904, Tver, Russia*

[3]*Ioffe Institute, 194021, St. Petersburg, Russia*

[4]*Institute of Problems of Mechanical Engineering RAS, 199178, St. Petersburg, Russia*

Silicon carbide (SiC) is one of the key semiconductor materials for power electronics and photoelectric transducers and sensors. In optoelectronics, nanometer silicon carbide layers grown on silicon substrates (SiC/Si) are used as a buffer layer for the formation of epitaxial layers of gallium and aluminum nitrides [1]. Moreover, hexagonal modifications of SiC are polar ones possessed the macroscopic spontaneous polarization [2].

In this work, surface morphology, dielectric properties and the photovoltaic activity induced by optical irradiation are studied for SiC/Si heterostructures subject to the donor or acceptor character of the silicon substrate doping. The thin SiC layers with 60-80 nm thickness were grown on the Si substrates by atoms substitution method [3]. The substrates with (111) orientation were doped with boron or phosphorus atoms. To study SiC layers topology, the atomic force microscope AFM Ntegra (NT-MDT) was used. Spectral distribution of the photovoltaic response was studied in the optical range of 400-1000 nm.

C-V dependences of SiC/Si structure revealed sharp changes in capacitance when the positive and negative voltage was applied (Fig. 1). It is evidenced the presence of a heterojunction barrier, in which the internal field direction depended on the type of the dopant.

The optical radiation effect on the SiC/Si structure induced the stationary photovoltaic response, whose sign also depended on the type of the dopant (Fig. 2).

The nature of the observed effects is discussed.

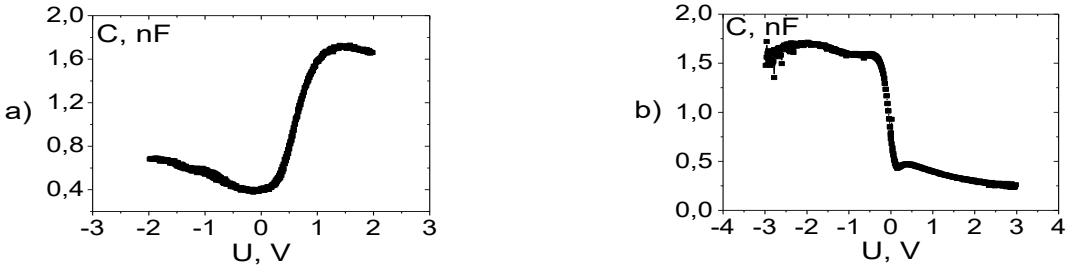

Figure 1. C-V dependences of SiC/Si structures doped with (a) boron or (b) phosphorus atoms.

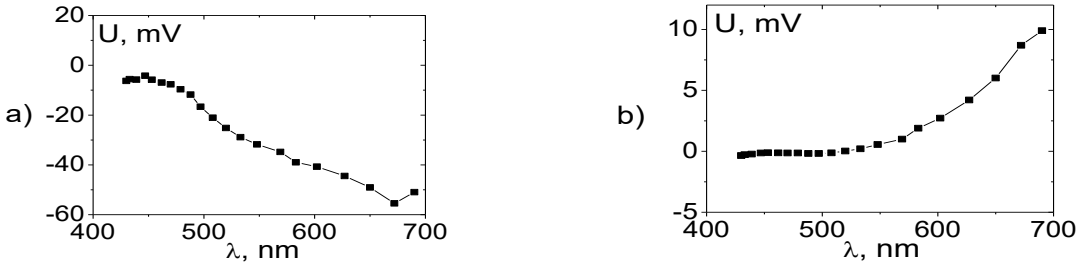

Figure 2. Spectral dependences of photovoltaic signal of SiC/Si structures doped with (a) boron or (b) phosphorus atoms.

1. V.N. Bessolov, Yu.V. Zhilyaev, E.V. Konenkova et al., *Technical Physics Lett.* **36**, 496 (2010).
2. S.Yu. Davydov, A.V. Troshin, *Physics of the Solid State*, **49**, 759 (2007).
3. S.A. Kukushkin, A.V. Osipov, I.P. Soshnikov, *Reviews on Adv. Mat. Sci.* **52**, 29 (2017).